**DIN EN ISO 9001: 2000
certified**

**ADDI-DATA GmbH
Dieselstraße 3
D-77833 OTTERSWEIER
+49 (0)7223 / 9493 – 0**

Technical description

APCI-1648/APCI-1696

TTL I/O board

Edition: 01.07 - 11/2007

WARNING

The following risks result from improper implementation and from use of the board contrary to the regulations:

♦   **Personal injury**

♦   **Damage to the board, PC and peripherals**

♦   **Pollution of the environment**

♦   **Protect yourself, the others and the environment!**

♦   **Read carefully the safety precautions (yellow leaflet).**

   If this leaflet is not with the documentation, please contact us and ask for it.

♦   **Observe the instructions of the manual.**

   Make sure that you do not forget or skip any step. We are not liable for damages resulting from a wrong use of the board.

♦   **Used symbols:**

i

   IMPORTANT!
   designates hints and other useful information.

   WARNING!
   It designates a possibly dangerous situation.
   If the instructions are ignored the board, PC and/or peripheral may be destroyed.

Figures

Tables

1   DEFINITION OF APPLICATION

1.1   Intended use

The **APCI-1648/APCI-1696** board must be inserted in a PC with PCI 5V/32-bit /
PCI 3.3V/64-Bit slots which is used as electrical equipment for measurement,
control and laboratory pursuant to the norm EN 61010-1 (IEC 61010-1). The used
personal computer (PC) must fulfil the requirements of IEC 60950-1 or EN
60950-1 and 55022 or IEC/CISPR 22 and EN 55024 or IEC/CISPR 24.

The use of the board **APCI-1648/APCI-1696** in combination with external screw
terminal panels requires correct installation according to IEC 60439-1 or EN
60439-1 (switch cabinet / switch box).

1.2   Usage restrictions

The **APCI-1648/APCI-1696** board must <u>not</u> to be used as safety related part
(SRP).

The board must <u>not</u> be used for safety related functions, for example for
emergency stop functions.

The **APCI-1648/APCI-1696** board must <u>not</u> be used in potentially explosive
atmospheres.

The **APCI-1648/APCI-1696** board must <u>not</u> be used as electrical equipment
according to the Low Voltage Directive 2006/95/EC.

1.3   General description of the board

Data exchange between the **APCI-1648/APCI-1696** board and the peripheral is to
occur through a shielded cable. This cable must be connected to the 50-pin
SUB-D male connector of the board

The board has 48 or 96 bidirectional input/output channels for processing TTL signals.

The **PX 8000** screw terminal board allows the connection of the digital signals
with a shielded cable. The connection with our standard cable **ST370-16** complies
with the following specifications:
- metallized plastic hoods
- shielded cable
- cable shield folded back and firmly screwed to the connector housing.

The use of the board in a PC could change the PC features regarding noise
emission and immunity. Increased noise emission or decreased noise immunity
could result in the system not being conform anymore.

Check the shielding capacity of the PC housing and of the cable prior to putting
the device into operation.

The use of the board according to its intended purpose includes observing all advises given in this manual and in the safety leaflet.

Uses beyond these specifications are not allowed. The manufacturer is not liable for any damages which would result from the non-observance of this clause.

Make sure that the board remains in its protective blister pack **until it is used**.

Do not remove or alter the identification numbers of the board.
If you do, the guarantee expires.

2   USER

2.1   Qualification

Only persons trained in electronics are entitled to perform the following works:
- installation
- use,
- maintenance.

2.2   Personal protection

Consider the country-specific regulations about:
- the prevention of accidents
- electrical and mechanical installations
- radio interference suppression.

3   HANDLING OF THE BOARD

Fig. 3-1: Correct handling
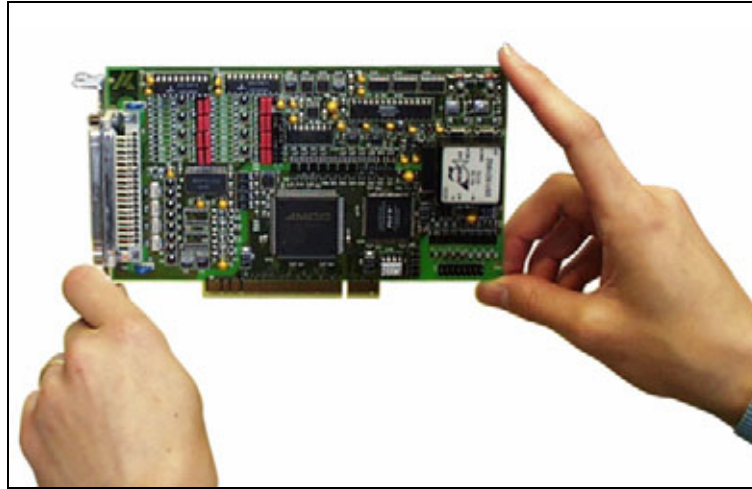
4   TECHNICAL DATA

4.1   Electromagnetic compatibility (EMC)

The board **APCI-1648/APCI-1696[1]** complies with the European EMC directive. The tests were carried out by a certified EMC laboratory in accordance with the norm from the EN 61326 series (IEC 61326). The limit values as set out by the European EMC directive for an industrial environment are complied with.

The respective EMC test report is available on request.

4.2   Physical set-up of the board

The board is assembled on a 4-layer printed circuit card.

Dimensions:
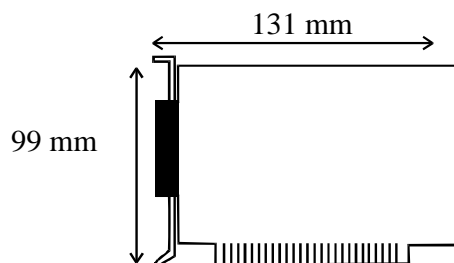
Weight: .... approx. 160 g
Installation in: .... 32/64-bit PCI slot 5 V or 3.3 V
Connection to the peripheral: ....
APCI-1648: .... 50-pin SUB-D male connector
APCI-1696:
50-pin SUB-D male connector: .... TTL I/O 0 to 47
50-pin male connector: .... TTL I/O 48 to 95

Accessories[2]:
Standard cable: ST370-16
Screw terminal board: .... PX 8000

APCI-1696: The ribbon cable FB8001 for connecting the TTL I/O 48 to 95 is included in the standard delivery.

WARNING!
The supply lines must be installed safely against mechanical loads.

4.3   Limit values

Max. altitude: .... 2000 m

---

[1] The test was carried out with an APCI-1696 board.
[2] Not included in the standard delivery.

Operating temperature: .... 0 to 60°C
Storage temperature: .... -25 to 70°C
Relative humidity at indoor installation
50% at +40 °C
80% at +31 °C

Minimum PC requirements:
PCI BIOS from Version 1.0
Bus speed: .... < 33 MHz
Operating system: .... Windows NT, 98, 2000

Required slots
APCI-1648: 1
APCI-1696: .... 1+1
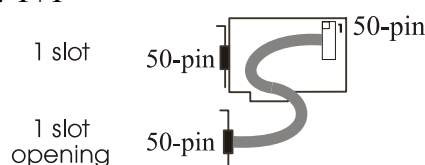
Energy requirements:
- Operating voltage: .... 5 V, 3.3 V from the PC
- Current consumption
APCI-1648
all channels connected as inputs: .... 51 mA ± 10 %
TTL-channels connected as outputs: .... 110 mA ± 10 %
APCI-1696
all channels connected as inputs: .... 51 mA ± 10 %
TTL-channels connected as outputs: .... 124 mA ± 10 %

Inputs and outputs
APCI-1648: .... 48 TTL inputs and outputs,
                                                                     6 independent modules with
                                                                     each 8 TTL input/output channels
APCI-1696: .... 96 TTL inputs and outputs,
                                                                     12 independent modules with
                                                                     each 8 TTL input/output channels
I/O address range: .... 128 bytes
Access: 8-bit, 32-bit
Programming: .... through I/O read or write commands
Driver type: .... 74 HCT 574
Max. input and output voltage: .... TTL input level compliant
Max. output load: .... 15 LS TTL loads
Max. output current: .... DC ± 35 mA
Signal delay: .... 70 ns

4.4   Component scheme

Fig. 4-1: Component scheme (component side)
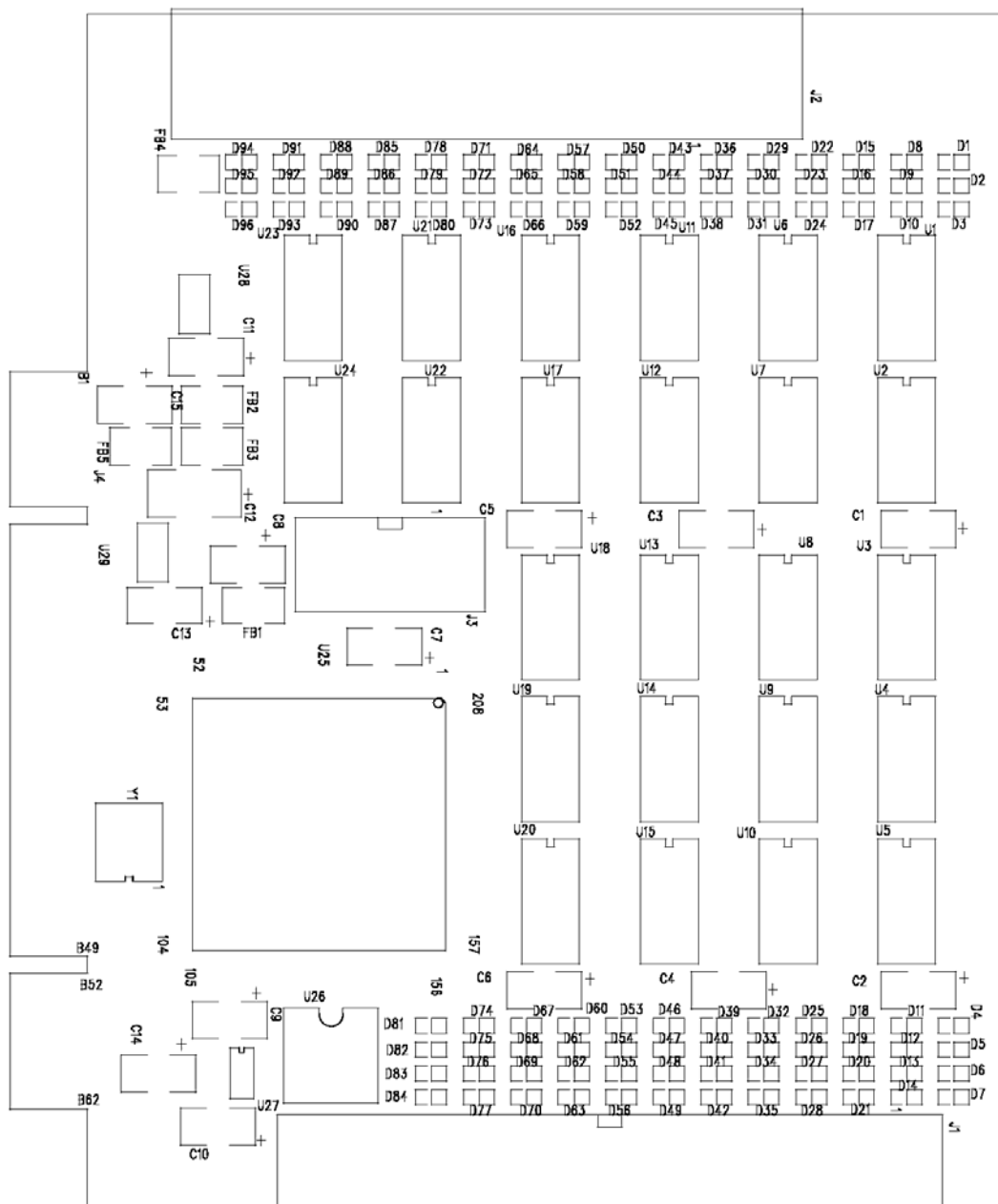
Fig. 4-2: Component scheme (solder side)
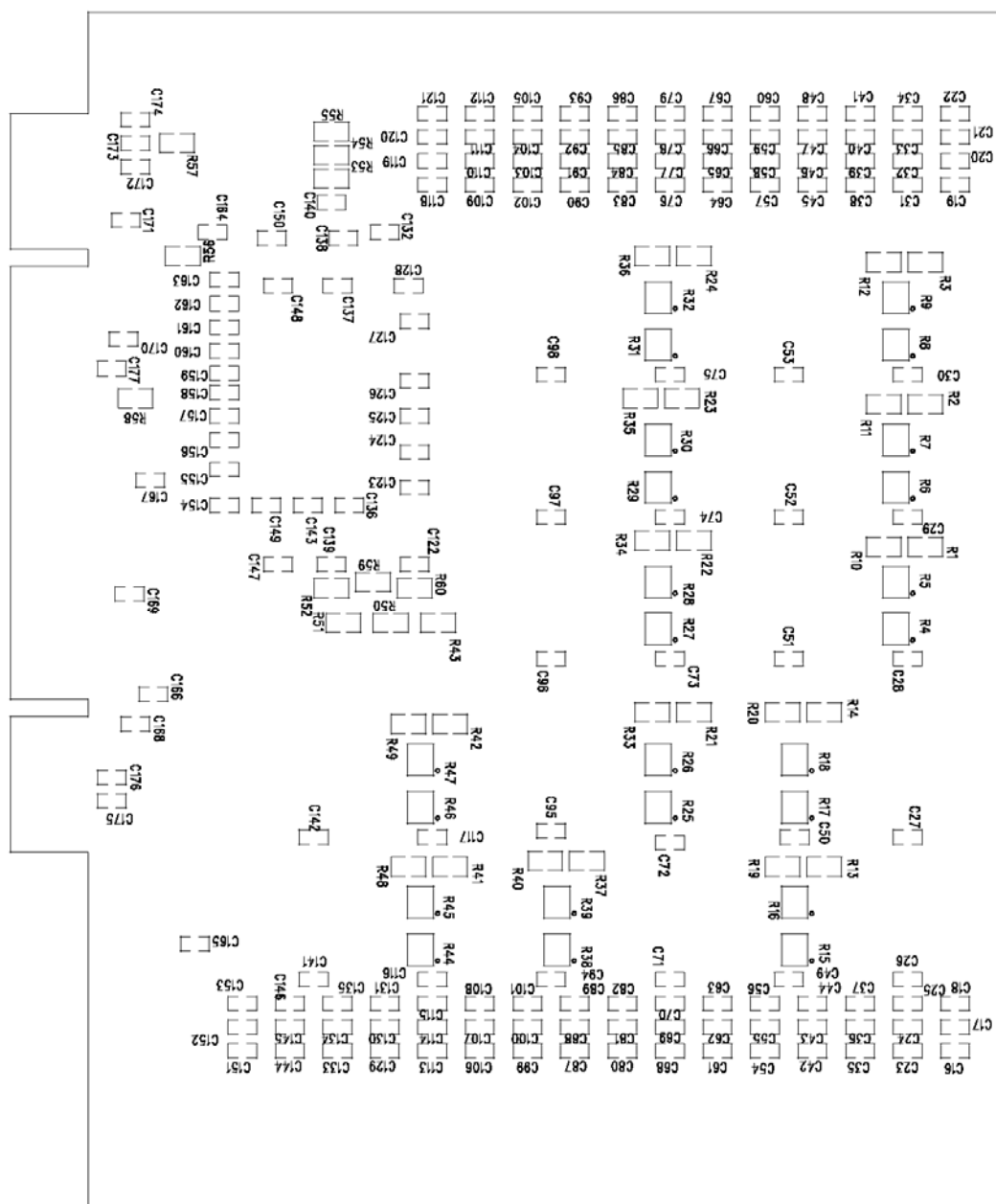
5   INSTALLATION OF THE BOARD

i   **IMPORTANT!**
Do observe the safety precautions (yellow leaflet)!

5.1   Opening the PC

♦ **Switch off your PC and all the units connected to the PC**

♦ **Pull the PC mains plug from the socket.**

♦ **Open your PC as described in the manual of the PC manufacturer.**

5.2   Selecting a free slot

Insert the board in a free PCI-5V or PCI-3.3 V slot (32-/64-bit).

i   **IMPORTANT!**
The board APCI-1696 requires 1 free slot and 1 free slot opening.
See page 10.

Fig. 5-1: Slot types

Front bracket openings

5 V slot

3.3 V slot

5 V slot

3.3 V slot

32-bits

64-bits
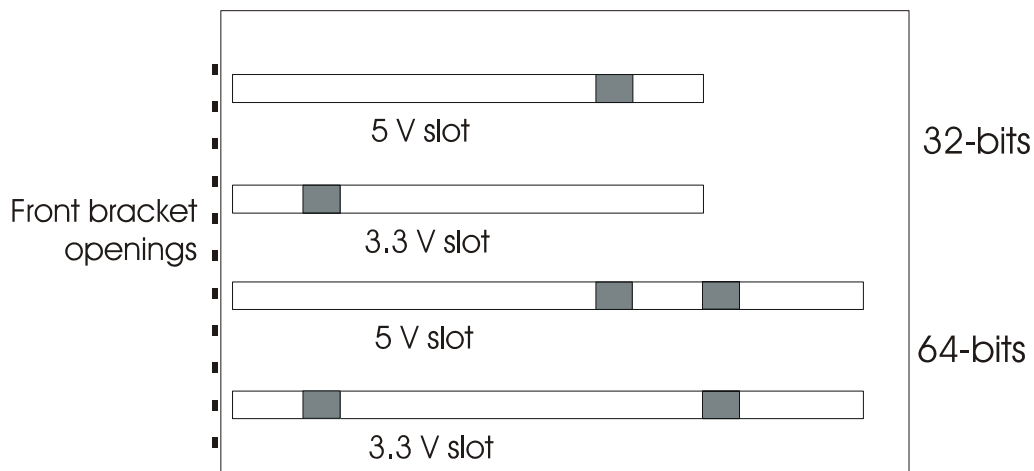
Remove the back cover of the selected slot according to the instructions of the
PC manufacturer. Keep the back cover. You will need it if you remove the board

♦ **Discharge yourself from electrostatic charges.**

14

♦ **Take the board out of its protective pack.**

5.3   Plugging the board into the slot

♦ Insert the board **vertically into the chosen slot.**

Fig. 5-2: Inserting the board
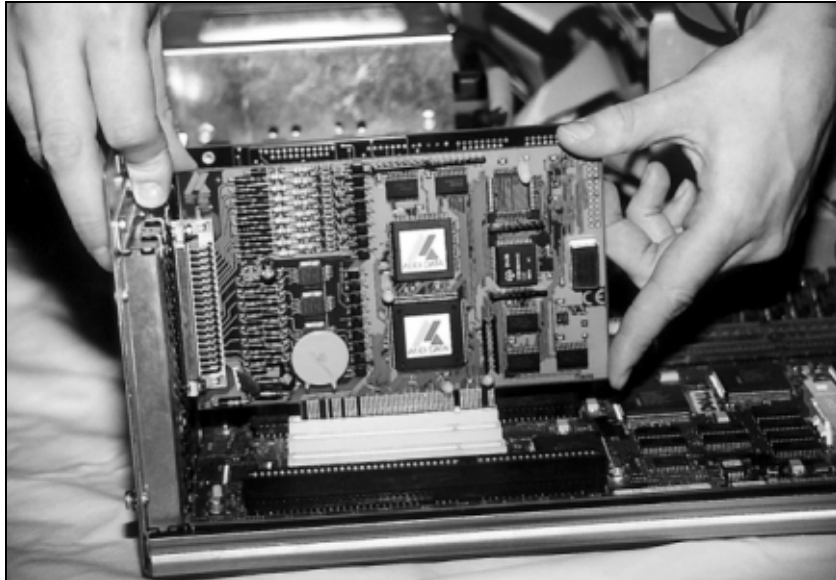
♦ Fasten the board **to the rear of the PC housing with the screw which was fixed on the back cover.**

Fig. 5-3: Fastening the board at the back cover
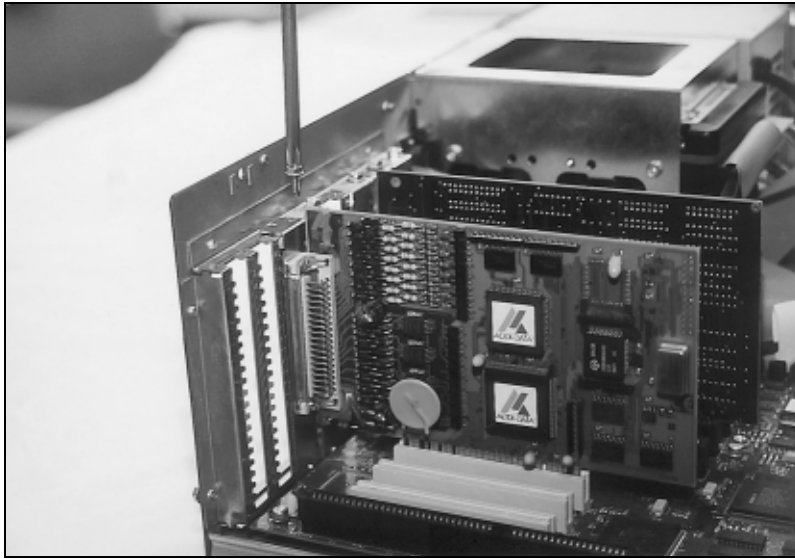
♦ **Tighten all the loosen screws.**

5.4   Closing the PC

♦ **Close your PC as described in the manual of the PC manufacturer.**

6   SOFTWARE

In this chapter you will find a description of the delivered software and its possible applications.

i
IMPORTANT!
Further information for installing and uninstalling the different drivers is to be found in the delivered description **"Installation instructions for the PCI and ISA bus".**

A link to the corresponding PDF file is available in the navigation pane (Bookmarks) of Acrobat Reader.

i
IMPORTANT!
The supported software functions for the **APCI-1648/APCI-1696** are listed in chapter 9.

The board is supplied with a CD-ROM containing the ADDIPACK software package for Windows NT 4.0 and Windows XP/2000/98.

ADDIPACK is composed of following programs:

- **ADDIREG:** The ADDIREG registration program is a 32-bit program for Windows NT 4.0 and Windows XP/2000/98. The user can register all hardware information necessary to operate the ADDI-DATA PC boards.

- **ADDIDRIVER** contains API functions to operate the ADDI-DATA boards in 32 bits.

- **ADDevice Manager** configures the resources of the ADDI-DATA virtual board (See below).

- **ADDI-DATA virtual board:**
  ADDI-DATA software is based on the principle of a **virtual board:** it transposes the different functions (e.g. digital inputs, analog outputs, timer, ...) of all inserted ADDI-DATA boards as the functions of a single (virtual) board. The virtual board features a pool of functions, the functionality of which can be called up without calling a specific board.

- **ADDEVICE MAPPER** was specifically developed for the ADDIPACK boards to facilitate the management of the virtual board. With this program you can optimally adapt the virtual board to your application requirements.

  IMPORTANT!
  For some functions of the **ADDEVICE MAPPER** program the browser Internet Explorer 6 or higher has to be installed on your PC.

6.1 Board registration

When starting the set-up of ADDIREG, the APCI-1648/APCI-1696 is automatically recognised and registered.

6.1.1 Installation of a new board

If a new board is recognised, the following window is displayed:

Fig. 6-1: New inserted board
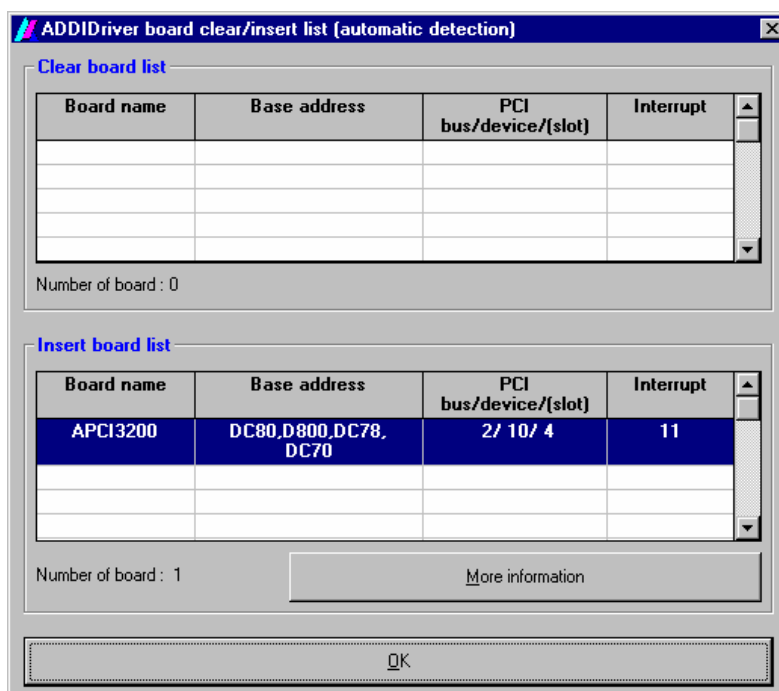
The boards which have been removed from the PC since the last ADDIREG start are listed in the upper table

The new inserted boards are listed in the lower table.

In case further information is required for the operation of the board, click on "More Information". ADDevice Manager is started.

18

ADDevice Manager

Fig. 6-2: ADDevice Manager
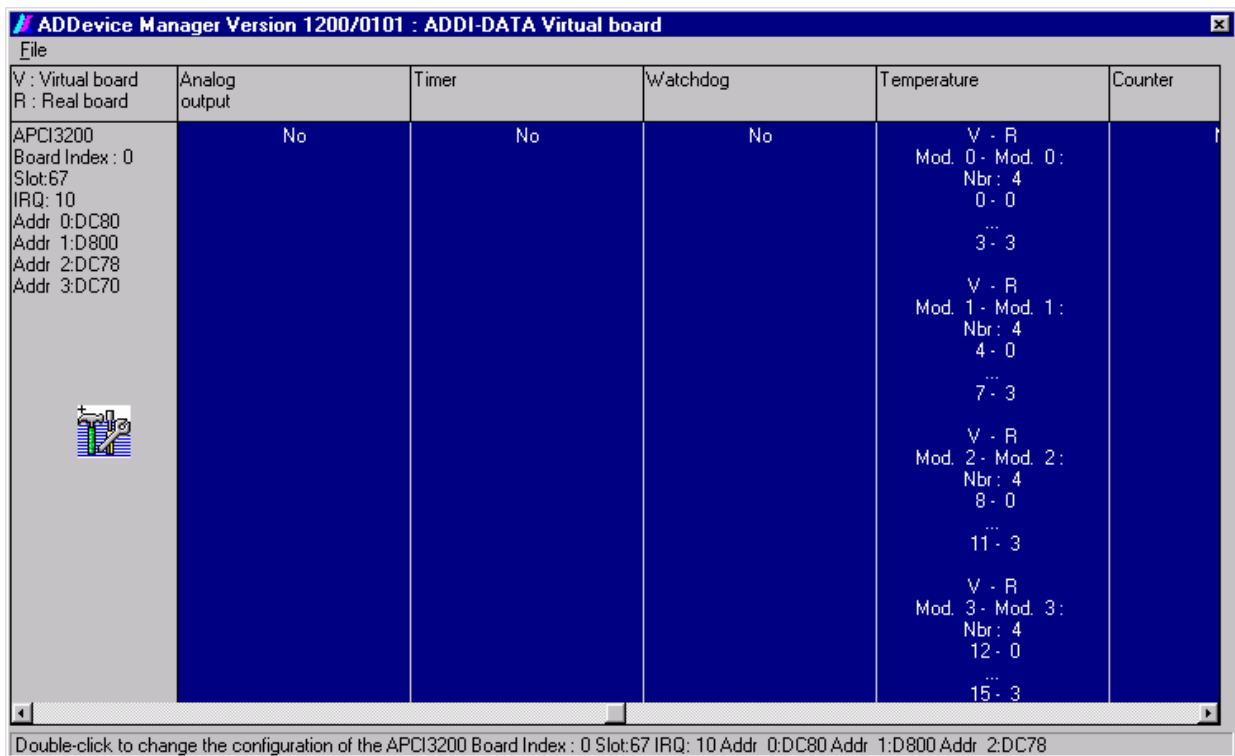
The following parameters are displayed for every inserted board:

First column:
- Board name
- Board index: Number allocated to the board when it is registered in ADDIREG.
- Slot number
- IRQ line
- Different addresses which are automatically allocated to the board by the BIOS.

Other columns:

The program distinguishes between the resources (Analog/digital input/output, watchdog, ...) of the virtual board (**V,** software) and the real board (**R,** board).

The following parameters are listed
- Module number,
- Number of resources
- Index: The first index line represents the number of the first resource (left: virtual resource - right: real board) The second index line represents the number of the last resource (left: virtual resource - right: real board).
- Type (24 V/5 V, voltage/current, HS/OC - High-Side/Open collector).
- IRQ: if the input channels are interruptible, the program displays the number of the first and of the last input channel

By clicking twice within a column, the connection principle and the technical data of the resource are displayed. This function is only possible if a question mark appears with the cursor.

You can export the set configuration as a text file. Click on "file" and save the configuration as a .txt file with "Export information to file...". You can then print the configuration or use it for other boards.

Configuration of the APCI-1648/APCI-1696

If a tool icon appears together with the cursor in the first column of the ADDevice Manager, you can modify the board configuration (click twice), else not.

The modules of the **APCI-1648**/**APCI-1696** can be parameterised either as input or output.

Fig. 6-3: Configuration of the TTL I/O
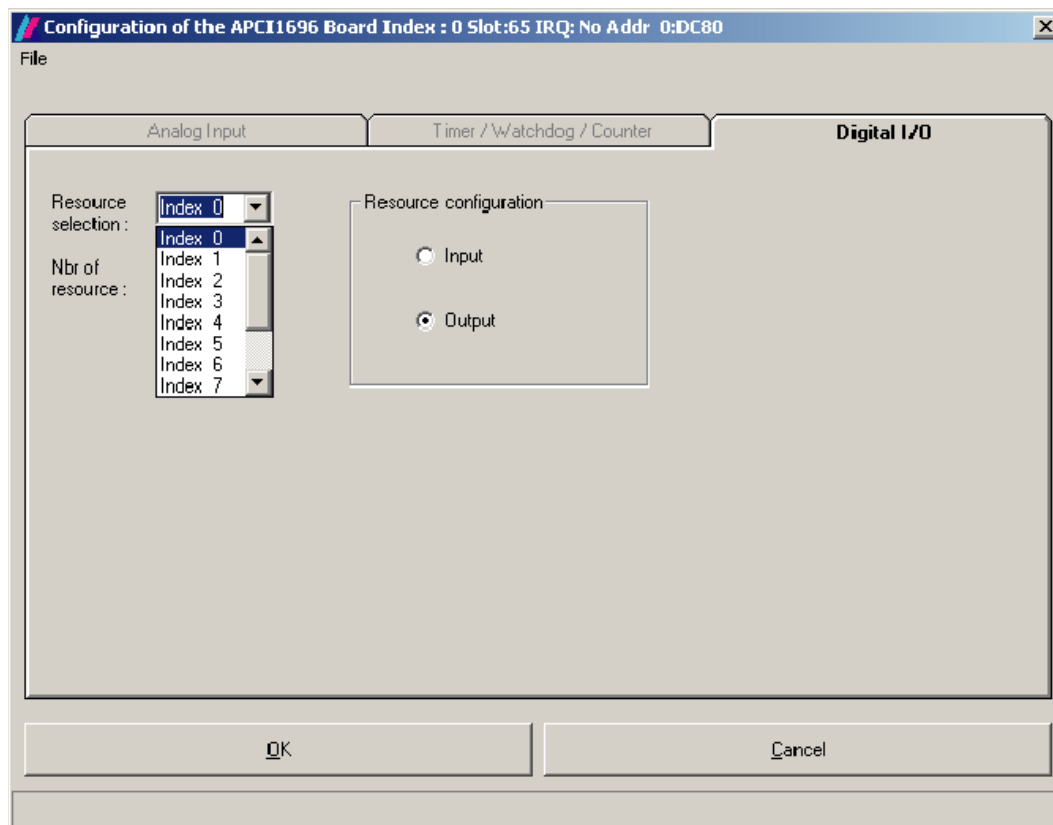
Each module (8 lines) can independently be configured.

♦ **Select the module to configure.**

♦ **Under "Resource configuration" select the channel type.**

After setting all modules, the TTL inputs and outputs are monitored through the standard API functions of ADDIDRIVER (See page 29).

Once you have controlled the registration, you can quit the window of ADDevice Manager. The board is ready to operate.

6.1.2 Changing the registration of a board

You can change the current board configuration with ADDIREG.

Description of the ADDIREG program

The program is automatically installed with ADDIPACK.
Start ADDIREG under Start/Programme/ADDIPACK/ADDIREG.

i   **IMPORTANT!**
First quit all the applications (programs) which use the board
before starting the ADDIREG program.

In the main window of ADDIREG the fields "Insert" and "Clear" are not available
for the board.

Fig. 6-4: ADDIREG registration program (example)
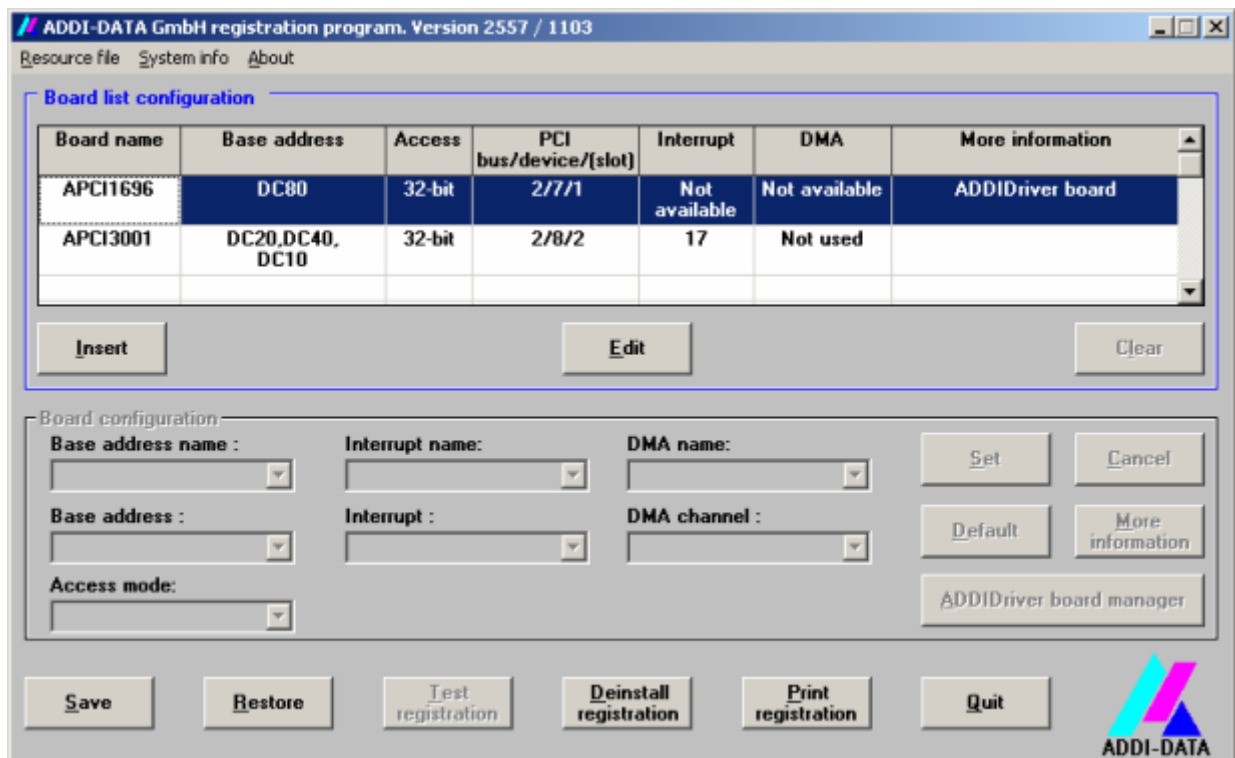
Table:

Board name:
Names of the different registered boards (e.g.: APCI-3200).

Base address:
Selected base address of the board. For PCI boards the base address is allocated through BIOS.

Access:
Selection of the access mode for the ADDI-DATA digital boards.
Access in 8-bit or 16-bit or 32-bit mode.

PCI bus/device/(slot):
Number of the used PCI bus, slot, and device. If the board is no PCI board, the message "NO" is displayed.

Interrupt:
Used interrupt of the board. If the board supports no interrupt, the message "Not available" is displayed. **For PCI boards the interrupt is allocated through BIOS.**

DMA (ISA boards only):
Indicates the selected DMA channel or "Not available" if the board uses no DMA or if the board is no ISA board.

More information:
Additional information like the identifier string or the installed COM interfaces. It also displays whether the board is programmed with ADDIDRIVER or if a **PCI DMA** memory is allocated to the board.

Text boxes:

Base address name:
Description of the used base addresses for the board. Select a name through the pull-down menu. The corresponding address range is displayed in the field below (Base address).

Interrupt name:
Description of the used IRQ lines for the board. Select a name through the pull-down menu. The corresponding interrupt line is displayed in the field below (Interrupt).

DMA name (for ISA boards only):
When the board supports 2 DMA channels, you can select which DMA channel is to be changed.

DMA channel (for ISA boards only):
Selection of the used DMA channel.

Buttons:

<u>E</u>dit:
Selection of the highlighted board with the different parameters set in the text boxes.

<u>S</u>et:
Sets the parameterised board configuration. The configuration should be set before you save it.

<u>C</u>ancel:
Reactivates the former parameters of the saved configuration.

<u>D</u>efault:
Sets the standard parameters of the board.

<u>M</u>ore information (not available for the boards with ADDIPACK)
You can change the board specific parameters like the identifier string, the COM number, the operating mode of a communication board, etc...
If your board does not support these information, you cannot activate this button.

ADDIDriver Board Manager:
Under Edit/ADDIDriver Board Manager you can check or change the current settings of the board set through the ADDEVICE Manager.
ADDevice Manager starts and displays a list of all resources available for the virtual board.

<u>T</u>est registration:
Controls if there is a conflict between the board and other devices installed in the PC. A message indicates the parameter which has generated the conflict. If no conflict has occurred, "Test of device registration OK" is displayed.

<u>D</u>einstall registration:
Deinstalls the registrations of all boards listed in the table and deletes the entries of the boards in the Windows Registry.

<u>P</u>rint registration:
Prints the registration parameter on your standard printer.

<u>Q</u>uit:

Registration test

Under "Test registration" you can test if the registration is "OK".
This test controls if the registration is right and if the board is present. If the test has been successfully completed you can quit the ADDIREG program. The board is initialised with the set parameters and can now be operated.

In case the registration data is to be modified, it is necessary to boot your PC again. A message asks you to do so. When it is not necessary you can quit the ADDIREG program and directly begin with your application.

6.2   Questions and software downloads on the web

Do not hesitate to e-mail us your questions.
per e-mail: info@addi-data.de   or
                         hotline@addi-data.de

Free downloads of standard software

You can download the latest version of the software for the board
APCI-1648/APCI-1696.

http://www.addi-data.com

i

IMPORTANT!
Before using the board or in case of malfunction during
operation, check if there is an update of the product (technical
description, driver). The current version can be found on the
internet or contact us directly.

7   CONNECTING THE PERIPHERAL

7.1   Connector pin assignment

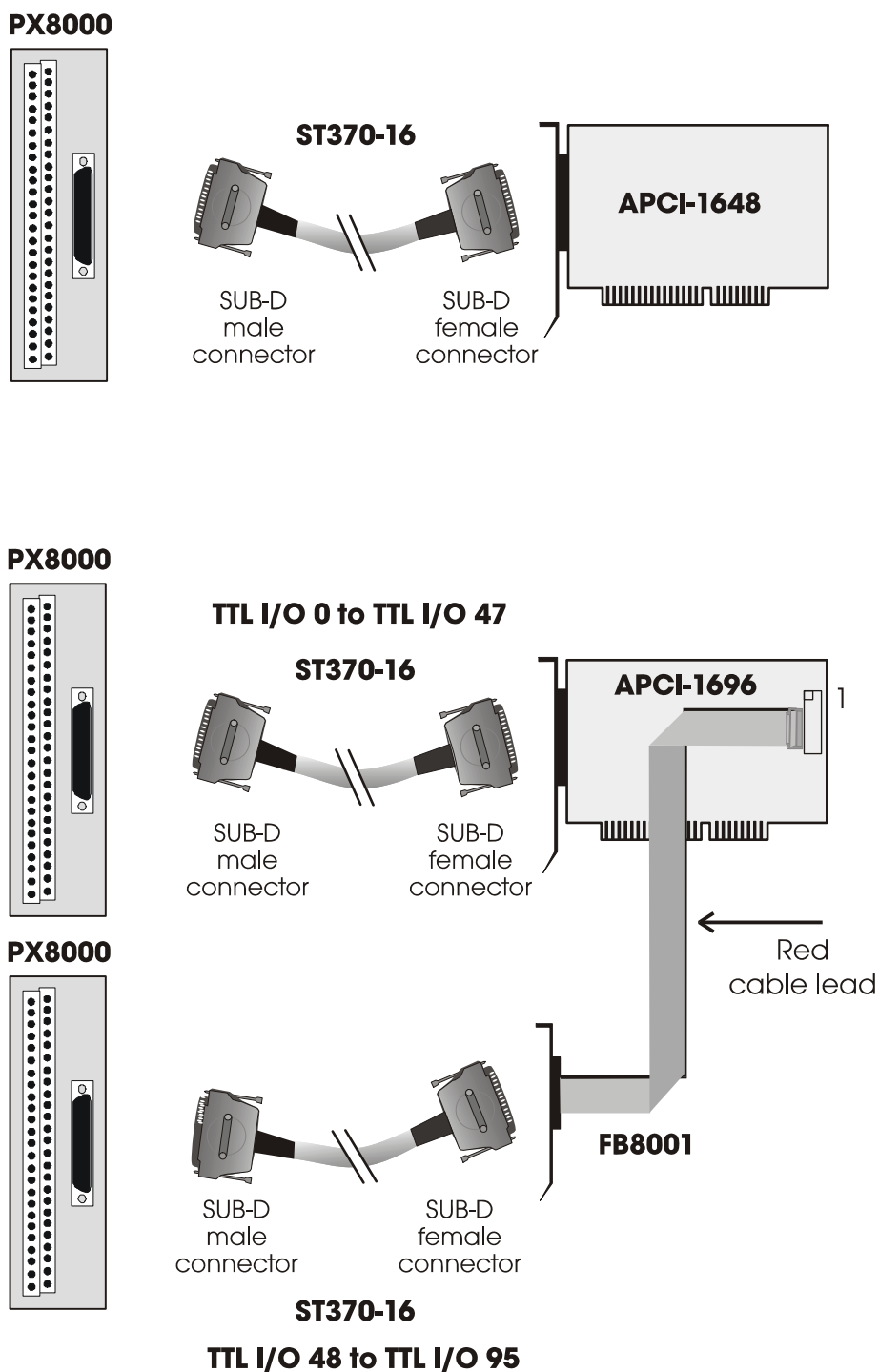**Fig. 7-1: 50-pin SUB-D male connector (TTL I/O 0 to TTL I/O 47)**

Pin			Pin					Pin
34	module 4	TTL I/O 33	18	module 2	TTL I/O 17	34 / 18 / 1	TTL I/O 0	1
35		TTL I/O 34	19		TTL I/O 18	35 / 2	TTL I/O 1	2
36		TTL I/O 35	20		TTL I/O 19	36 / 3	TTL I/O 2	3
37		TTL I/O 36	21		TTL I/O 20	37 / 4	TTL I/O 3	4
38		TTL I/O 37	22		TTL I/O 21	38 / 5	TTL I/O 4	5
39		TTL I/O 38	23		TTL I/O 22	39 / 6	TTL I/O 5	6
40		TTL I/O 39	24		TTL I/O 23	40 / 7	TTL I/O 6	7
41	module 5	TTL I/O 40	25	module 3	TTL I/O 24	41 / 8	TTL I/O 7	8
42		TTL I/O 41	26		TTL I/O 25	42 / 9	TTL I/O 8	9
43		TTL I/O 42	27		TTL I/O 26	43 / 10	TTL I/O 9	10
44		TTL I/O 43	28		TTL I/O 27	44 / 11	TTL I/O 10	11
45		TTL I/O 44	29		TTL I/O 28	45 / 12	TTL I/O 11	12
46		TTL I/O 45	30		TTL I/O 29	46 / 13	TTL I/O 12	13
47		TTL I/O 46	31		TTL I/O 30	47 / 14	TTL I/O 13	14
48		TTL I/O 47	32		TTL I/O 31	48 / 15	TTL I/O 14	15
49		GND	33	mod. 4	TTL I/O 32	49 / 16	TTL I/O 15	16
50		GND				50 / 33 / 17	TTL I/O 16	17

module 0 / module 1 / mod. 2

Fig. 7-2: 50-pin SUB-D male connector (TTL I/O 48 to TTL I/O 95)

TTL I/O 48	1		2	TTL I/O 81	
TTL I/O 65	3		4	TTL I/O 49	
TTL I/O 82	5		6	TTL I/O 66	
TTL I/O 50	7		8	TTL I/O 83	
TTL I/O 67	9		10	TTL I/O 51	
TTL I/O 84	11		12	TTL I/O 68	
TTL I/O 52	13		14	TTL I/O 85	
TTL I/O 69	15		16	TTL I/O 53	
TTL I/O 86	17		18	TTL I/O 70	
TTL I/O 54	19		20	TTL I/O 87	
TTL I/O 71	21		22	TTL I/O 55	
TTL I/O 88	23		24	TTL I/O 72	
TTL I/O 56	25		26	TTL I/O 89	
TTL I/O 73	27		28	TTL I/O 57	
TTL I/O 90	29		30	TTL I/O 74	
TTL I/O 58	31		32	TTL I/O 91	
TTL I/O 75	33		34	TTL I/O 59	
TTL I/O 92	35		36	TTL I/O 76	
TTL I/O 60	37		38	TTL I/O 93	
TTL I/O 77	39		40	TTL I/O 61	
TTL I/O 94	41		42	TTL I/O 78	
TTL I/O 62	43		44	TTL I/O 95	
TTL I/O 79	45		46	TTL I/O 63	
GND	47		48	TTL I/O 80	
TTLI/O 64	49		50	GND	

Ribbon cable FB8001

Pin			Pin					Pin
34	module 10	TTL I/O 81	18	module 8	TTL I/O 65	34 / 18 / 1	TTL I/O 48	1
35		TTL I/O 82	19		TTL I/O 66	35 / 2	TTL I/O 49	2
36		TTL I/O 83	20		TTL I/O 67	36 / 3	TTL I/O 50	3
37		TTL I/O 84	21		TTL I/O 68	37 / 4	TTL I/O 51	4
38		TTL I/O 85	22		TTL I/O 69	38 / 5	TTL I/O 52	5
39		TTL I/O 86	23		TTL I/O 70	39 / 6	TTL I/O 53	6
40		TTL I/O 87	24		TTL I/O 71	40 / 7	TTL I/O 54	7
41	module 11	TTL I/O 88	25	module 9	TTL I/O 72	41 / 8	TTL I/O 55	8
42		TTL I/O 89	26		TTL I/O 73	42 / 9	TTL I/O 56	9
43		TTL I/O 90	27		TTL I/O 74	43 / 10	TTL I/O 57	10
44		TTL I/O 91	28		TTL I/O 75	44 / 11	TTL I/O 58	11
45		TTL I/O 92	29		TTL I/O 76	45 / 12	TTL I/O 59	12
46		TTL I/O 93	30		TTL I/O 77	46 / 13	TTL I/O 60	13
47		TTL I/O 94	31		TTL I/O 78	47 / 14	TTL I/O 61	14
48		TTL I/O 95	32		TTL I/O 79	48 / 15	TTL I/O 62	15
49		GND	33	mod. 10	TTL I/O 80	49 / 16	TTL I/O 63	16
50		GND				50 / 33 / 17	TTL I/O 64	17

module 6 / module 7 / mod. 8

7.2   Connection examples

Fig. 7-3: Connection to the screw terminal panel PX 8000

IMPORTANT!
Insert the FB on the connector with **the red cable lead on the side of the pin 1.**

8   FUNCTIONS OF THE BOARD

8.1   Block diagrams

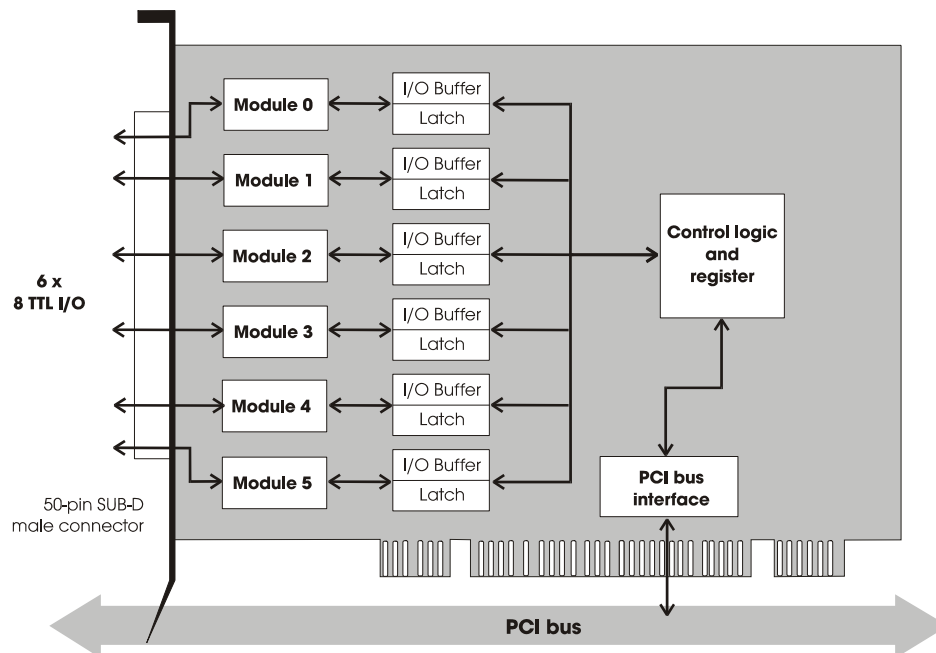Fig. 8-1: Block diagram of the APCI-1648

Fig. 8-2: Block diagram of the APCI-1696
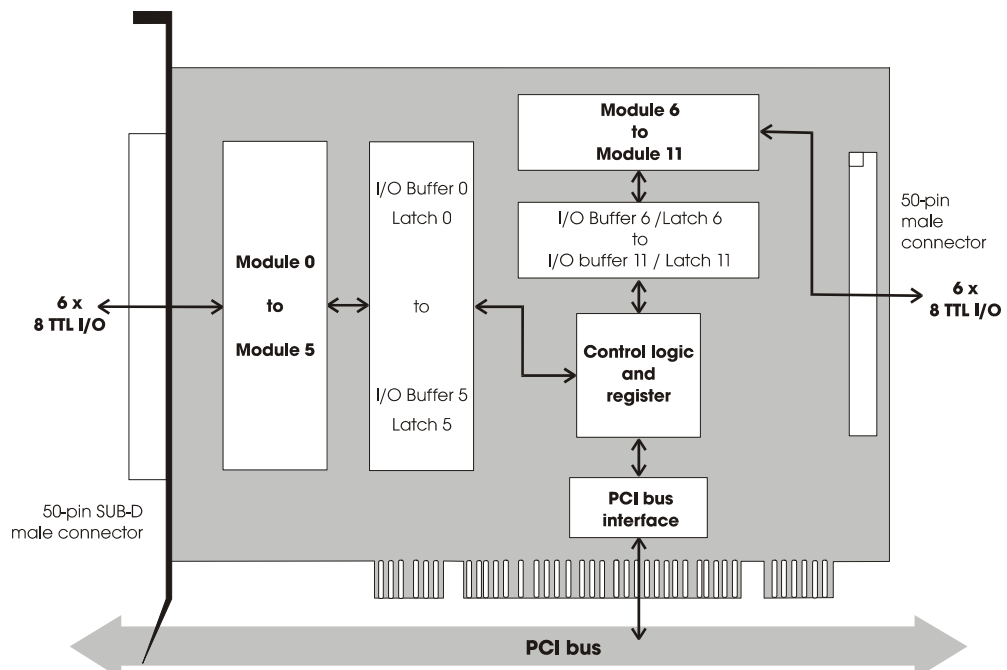
8.2   TTL inputs and outputs

The configuration of the inputs and outputs is modular. One module includes 8 channels and can be configured either as input or output.

Up to 15 TTL loads can be controlled through the **TTL outputs**.

The combination of several inputs and outputs allows data to be exchanged in parallel and bidirectionally with various peripheral devices.

WARNING!
The outputs are not protected against short circuit.

9   STANDARD SOFTWARE

9.1   Software functions

ADDIPACK supports the following functions for the APCI-1648/APCI-1696.

Table 9-1: Supported software functions

Functionality	Function name
Common functions	i_ADDIDATA_OpenWin32Driver
	i_ADDIDATA_GetCurrentDriverHandle
	i_ADDIDATA_GetDriverVersion
	i_ADDIDATA_GetLocalisation
	b_ADDIDATA_CloseWin32Driver
Error	i_ADDIDATA_GetLastError
	i_ADDIDATA_GetLastErrorAndSource
	b_ADDIDATA_EnableErrorMessage
	b_ADDIDATA_DisableErrorMessage
	b_ADDIDATA_FormatErrorMessage
Digital inputs	b_ADDIDATA_GetNumberOfDigitalInputs
	b_ADDIDATA_GetDigitalInputInformation
	b_ADDIDATA_Read1DigitalInput
	b_ADDIDATA_Read2DigitalInputs
	b_ADDIDATA_Read4DigitalInputs
	b_ADDIDATA_Read8DigitalInputs
	b_ADDIDATA_Read16DigitalInputs
	b_ADDIDATA_Read32DigitalInputs
Digital outputs	b_ADDIDATA_GetNumberOfDigitalOutputs
	b_ADDIDATA_GetDigitalOutputInformation
	b_ADDIDATA_SetDigitalOutputMemoryOn
	b_ADDIDATA_SetDigitalOutputMemoryOff
	b_ADDIDATA_Set1DigitalOutputOn
	b_ADDIDATA_Set1DigitalOutputOff
	b_ADDIDATA_Set2DigitalOutputsOn
	b_ADDIDATA_Set2DigitalOutputsOff
	b_ADDIDATA_Set4DigitalOutputsOn

Functionality	Function name
Digital outputs	b_ADDIDATA_Set4DigitalOutputsOff
	b_ADDIDATA_Set8DigitalOutputsOn
	b_ADDIDATA_Set8DigitalOutputsOff
	b_ADDIDATA_Set16DigitalOutputsOn
	b_ADDIDATA_Set16DigitalOutputsOff
	b_ADDIDATA_Set32DigitalOutputsOn
	b_ADDIDATA_Set32DigitalOutputsOff
	b_ADDIDATA_Get1DigitalOutputStatus
	b_ADDIDATA_Get2DigitalOutputStatus
	b_ADDIDATA_Get4DigitalOutputStatus
	b_ADDIDATA_Get8DigitalOutputStatus
	b_ADDIDATA_Get16DigitalOutputStatus
	b_ADDIDATA_Get32DigitalOutputStatus

9.2   Software samples

Table 9-2: Supported software samples

Functionality	Sample number	Description
Digital inputs	SAMPLE01	Read 1 digital input
	SAMPLE02	Read 2 digital inputs
	SAMPLE03	Read 4 digital inputs
	SAMPLE04	Read 8 digital inputs
	SAMPLE05	Read 16 digital inputs
	SAMPLE06	Read 32 digital inputs
Digital outputs	SAMPLE01	Test 1 digital output with/without output memory
	SAMPLE02	Test 2 digital outputs with/without output memory
	SAMPLE03	Test 4 digital outputs with/without output memory
	SAMPLE04	Test 8 digital outputs with/without output memory
	SAMPLE05	Test 16 digital outputs with/without output memory
	SAMPLE06	Test 32 digital outputs with/without output memory

10 GLOSSARY

Table 10-1: Glossary

Term	Description
A/D converter	= *ADC* An electronic device that produces a digital output directly proportional to an analog signal output.
Acquisition	The process by which data is gathered by the computer for analysis or storage.
Bus	The group of conductors that interconnect individual circuitry in a computer. Typically, a bus is the expansion vehicle to which I/O or other devices are connected. Examples of PC buses are PCI, PC Card (PCMCIA), ISA (AT), and EISA bus.
Counter	A circuit that counts pulses or measures pulse duration
D/A converter	= *DAC* A device that converts digital information into a corresponding analog voltage or current.
Data acquisition	Gathering information from sources such as sensors and transducers in an accurate, timely and organized manner. Modern systems convert this information to digital data which can be stored and processed by a computer.
DC voltage	= *Direct current voltage* DC voltage means that the voltage is constant respecting the time. It will always fluctuate slightly. Especially at switching on and switching off the transition behaviour is of high significance.
Digital signal	A signal which has distinct states. Digital computers process data as binary information having either 1 or 0 states.
Disturb signal	Interferences that occur during the transfer caused by reduced bandwidth, attenuation, gain, noise, delay time etc.
Driver	A part of the software that is used to control a specific hardware device such as a data acquisition board or a printer.
Gain	The factor by which an incoming signal is multiplied.
Ground	A common reference point for an electrical system.
Inductive loads	The voltage over the inductor is U=L.(dI/dt), whereas L is the inductivity and I is the current. If the current is switched on fast, the voltage over the load can become very highly for a short time.
Interrupt	A signal to the CPU indicating that the board detected the occurrence of a specified condition or event.
Limit value	Exceeding the limit values, even for just a short time, can lead to the destruction or to a loss of functionality.
Noise immunity	Noise immunity is the ability of a device to work during an electromagnetic interference without reduced functions.

Operating voltage	The operating voltage is the voltage that occurs during the continuous operation of the device. It may not exceed the continuous limit voltage. Furthermore, any negative operation situations, such as net overvoltages over one minute at switching on the device must be taken in consideration.
Optical isolation	The technique of using an optoelectric transmitter and receiver to transfer data without electrical continuity, to eliminate high-potential differences and transients.
Output current	The maximum amount of current the sensor can supply across the output signal, expressed as amps DC (A DC).
Output voltage	The nominal voltage output reading when shaft is rotated to full range, expressed in volts DC /Vo DC)
Parameter	The parameters of a control comprise all fort he control process required numeric values, e.g. for limit values and technological number.
PCI bus	PCI bus is a fast local bus with a clock rate up to 33 MHz. This bus is used for processing a great number of data. The PCI bus is not limited like the ISA and EISA systems.
Protective circuitry	A protective circuitry of the active part is done in order to protect the control electronic. The simplest protective circuitry is the parallel switching of a resistance.
Reference voltage	Reference voltages are stable voltages that are used as reference unit. From them voltages can be derived that are required for example in current supplies and in other electronic circuitries.
Resolution	The smallest significant number to which a measurement can be determined. For example a converter with 12-bit resolution can resolve 1 part in 4096.
Sensor	A device that responds to physical stimuli (heat, light, sound, pressure, motion, etc.) and produces a corresponding electrical output.
Settling time	The time required, after application of a step input signal, for the output voltage to settle and remain within a specified error band around the final value. The settling time of a system includes that of all of the components of the system.
Short circuit	A short circuit of two clamps of an electric switch is when the concerning clamp voltage is zero.
Short circuit current	Short circuit current is the current between tow short-circuited clamps.
Signal delay	The change of a signal affects the following circuitries with finite velocity; the signal will be delayed. Besides the signal delay times that are not wanted, the signal delay can be extended by time switches and delay lines.
TTL	= *transistor-transistor-logic* A popular logic circuit family that uses multiple-emitter transistors.

11　INDEX